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DILOTAXIS OF THE EASTERN UNITED STATES, WITH A NEW SPECIES AND OTHER NOTES (COLEOP., SCARABAEIDAE)¹

By PATRICIA VAURIE²

During the course of a revisional study of the North American scarab beetles of the genus *Diploaxis*, subfamily Melolonthinae, it was found that only a dozen or so of the 165 or 170 species inhabit the eastern United States from the Atlantic Ocean to the Mississippi River. The purpose of this preliminary paper is to present a key for the identification of the species of this area with their known distributional pattern, to make known a new species, to bring the synonymy up to date, and to request the loan of specimens (of these species only) from any localities not included, such additional material to be incorporated in the final revision of the genus. The majority of specimens on which this paper is based are in the collection of the American Museum of Natural History; a few are from the collections of the University of California.³

The eastern species include many of the earliest described forms, including Kirby's genotype, *tristis*. With the exception of Fall's *atlantis*, all the species were described before 1900, most of them before 1860. Two species, *cephalotes* and *bowditchi* Fall; described from southern Illinois and Missouri respectively, are Mexican species that do not occur in the United States, the former being a synonym of the Mexican *simplex* Banchard. Five of the species are large (9 to 12 mm.), the remaining small; all are glabrous dorsally except *sordida*. Some of the species,

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²American Museum of Natural History.

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(*atlantis*, *frondicola*, *liberta*, *punctatorugosa*, *tristis*, and the *harperi-fulva* group) extend their ranges west of the Mississippi, some to Nebraska, Kansas, and Oklahoma; *liberta* and *tristis* have been taken in Ontario, Canada, and *tristis* also in Nova Scotia. *D. bidentata*, *subcostata*, *languida* and *rufa* occur in the Atlantic and Gulf coastal states but not inland, the latter two being known from Florida only.

Key to the Species of *Diploptaxis* of the Eastern United States

1. Head, pronotum, and elytra covered with short hairs.....**sordida**
 Head, pronotum, and elytra glabrous, without hairs.....**2**
2. Front of head behind clypeus rather abruptly transversely swollen, often pinched, and base of both elytra and pronotum on sides deeply depressed; small (8 to 9 mm.)
**punctatorugosa**
 Front of head behind clypeus not at all swollen, or if slightly so, then either size larger, 10 to 12 mm., or base of pronotum and elytra not depressed.....**3**
3. Front angles of pronotum either markedly acute (fig. 1), or impressed, or both; large (11 to 12 mm.).....**4**
 Front angles of pronotum not acute or impressed; large or small.....**5**
4. Pronotum sparsely, irregularly punctured (many impunctate areas); scutellum usually well punctured; labrum at middle same length as or shorter than reflexed underside of clypeus**liberta**
 Pronotum densely, uniformly punctured; scutellum usually virtually impunctate; labrum at middle longer than reflexed underside of clypeus.....**tristis**
5. Pronotum with a basal depression from side to side consisting of a line of impressed punctures usually bordered in front by impunctate space.....**harperi-fulva** group
 Pronotum without basal depressed line.....**6**
6. Front tibiae tridentate, the basal tooth in front of middle, the apical tooth no larger than the middle tooth (fig. 2).....**7**
 Front tibiae seemingly bidentate, basal tooth either obsolete, or very small and situated slightly behind the middle, apical tooth very long (fig. 3).....**8**
- 7 Large, 11 to 13 mm.; elytral costae visible, their punctures much smaller than those on wide intervals.....**atlantis**
 Small, 7 to 9 mm.; elytral costae scarcely recognizable because their punctures of same size as those on wide intervals.....**frondicola**
8. Head and clypeus with punctures so coarse, deep, and dense that the roughened surface is nearly tuberculate.....**rufa**
 Head and clypeus with punctures dense or sparse, but not causing surface to be rough or tuberculate**9**
9. Elytra very elongate, at least four times longer than pronotum; small, 6 to 8 mm., pale yellow**languida**
 Elytra no more than three times longer than pronotum; small or large, reddish to black**10**
10. Process between front coxae unicarinate; sides of pronotum evenly arcuate to front and hind angles; clypeal margin evenly arcuate; small, 8 to 9 mm.....**bidentata**
 Process between front coxae bicarinate (but unicarinate in two of 53 specimens); sides of pronotum bulging at middle, thence sinuate or constricted to front and hind angles; clypeal margin slightly emarginate or nearly truncate; usually over 9 mm.**subcostata**

All the above species have the claws bent and cleft apically, although less so in *tristis* and *liberta*, but they do not necessarily belong to the same group except geographically. Their affinities to other members of the genus are not discussed here but a few descriptive lines are given for each species. The species are arranged below in alphabetical order for convenience.

DISTRIBUTIONAL AND SYNONYMICAL NOTES

Specimens have been examined from all localities except those marked with an asterisk (*), which are taken from the literature. The only eastern states not represented are West Virginia and Wisconsin.

DIPLLOTAXIS ATLANTIS Fall, 1909

Type Locality: Rhode Island.

Synonym: *Diplotaxis nigra* Cartwright, 1939; type locality, Hinton, Oklahoma.

Atlantic coast and inland. *Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Delaware, District of Columbia, Maryland, *Virginia, *North Carolina, *Georgia, and inland in Michigan, Iowa, Kansas, and Oklahoma.

This large species is similar in many characters to *tristis* and *liberta* of the eastern species, differing from both in the shape of the pronotum which does not have the front angles acute or impressed.

Although the types of *atlantis* and *nigra* are from widely located spots, they are nonetheless the same species as shown by an examination of two topo paratypes of *nigra* and reexamination of the type by its author.

DIPLLOTAXIS BIDENTATA LeConte, 1856

Type Locality: Georgia.

Atlantic coast. New Jersey, North Carolina, Georgia, Florida.

A black, highly polished, very round, small species with the head and pronotum very sparsely punctured and the front tibiae, as in *languida* and some of the other species, virtually bidentate.

DIPLLOTAXIS FRONDICOLA (Say), 1825

Type Locality: United States.

Atlantic and Gulf coasts and inland. *New Jersey, Pennsylvania, *Maryland, *District of Columbia, Virginia, North Carolina, *Alabama, Mississippi, Louisiana, Texas, and inland, Kentucky, *Ohio, Indiana, Illinois, Missouri, Arkansas, *Nebraska, and Kansas.

A robust, light brown species with a large pronotum that is exceedingly uniformly densely punctured (head and clypeus also have same kind of punctuation). A number of other species from Texas and farther west (*thoracica*, *pinguescens*, *basalis*, *dubia*) might readily be confused where they occur together.

THE HARPERI-FULVA GROUP

The three eastern species of this group are as similar to one another externally as are the various confusing forms of the *trapezifera* Bates group of species from the southwestern United States, Mexico, and Central America (the U. S. representatives being *angularis*, *pinalica*, *chiricahuae*, etc.). In both groups, however, the male genitalia exhibit constant differences, and once the identity of each species can be established by the genitalia, then the slight external differences can be used to separate the species, at least in most cases.

When Fall said about *harperi* Blanchard that, "barring *texana*, which is closely allied, there is little danger of mistaking this species for any other," he did not know that there might be other species involved, all of which have, with slight variations, the general characters he gives, "the rounded clypeus, strongly transverse prothorax with sides straighter and less convergent than usual, with the distinctly impressed basal margin, and the rather course and dense punctuation," (1909, p. 80). He considered the type and only specimen of *Alobus fulvus* LeConte as an aberrant form of *harperi*. I also have seen this type and it is certainly a *Diplotaxis*, as shown by Fall, but I believe it is a distinct species very close to *harperi*. Of the 150 or so specimens examined in this group, I have identified only five as *fulva*; the males of *fulva* differ from 28 dissected males of *harperi* in the genitalia (figs. 4, 5), and both sexes of *fulva* differ in the straighter sides of the pronotum as well as in other relative characters, such as longer antennal club, longer and narrower palpal segment, larger pygidium, longer clypeus, larger eyes. The third species in the group is new and is described below.

DIPLOTAXIS FULVA, (LeConte), 1856

Type Locality: New York.

Known from New York and New Jersey only.

DIPLOTAXIS HARPERI Blanchard, 1850

Type Locality: Savannah, Georgia.

Atlantic coast and inland. Massachusetts, Pennsylvania, North Carolina, South Carolina, Georgia, Alabama, Texas, and inland in Indiana, Illinois, Iowa, Missouri, Arkansas, Kansas, and Oklahoma. Fall gives about ten additional states but there is no way of knowing whether he had *harperi* or the new species.

Diplotaxis blanchardi, new species

(Figures 6, 7)

Medium in size, reddish brown to piceous, head often black, glabrous dorsally; clypeus evenly arcuate; labrum large and flat; pronotum

strongly transverse; punctures large and coarse and deep; claws cleft subapically.

Description of Type: Male: Length 9 mm. Head with front rounded to clypeus but slightly declivous just behind clypeus, densely irregularly punctured in front, the punctures becoming sparser behind, with an impunctate space at middle of vertex; eyes very large, each eye about one quarter of width of vertex; clypeus without hairs, long, nearly one half of length of head, punctures somewhat denser than those on head, broadly rounded, margin straight in front, slightly reflexed, broadly rounded to sides which are scarcely sinuate. sides not reflexed; labrum large, nearly flat, shallowly curved in front, longer at middle than at sides and at least twice as long at middle as reflexed underside of clypeus, moderately punctured; mentum rather flat, irregularly declivous in front, the declivity more or less scalloped behind with an incomplete raised edge, the edge pubescent; palpi without dorsal impressed area on terminal segment; antennae 10-segmented, club as long as funicular segments combined. Pronotum rather flat, twice wider than long, widest just behind middle, lateral margins gently arcuate to basal and apical angles which are not produced or impressed, surface densely punctured except for impunctate area at middle base, punctures on sides rugose, sides at middle with a small round depression, punctures same size as those on head, base of pronotum impressed from side to side with large touching punctures. Scutellum with one puncture. Elytra irregularly punctured as on pronotum, three times longer than pronotum, second interval multipunctate, costae convex, with smaller punctures separated by about 4 or 5 times their diameters, surface exceedingly shiny, the punctures deep set, very confused, giving rugose appearance, marginal hairs short. Abdomen not ridged laterally; pygidium with large punctures as on elytral intervals, separated by about one half their diameters; last abdominal segment without groove above pygidium. Hind tarsi about as long as hind tibiae; first hind tarsal segment shorter than second and twice as wide at apex as at base, this segment shorter than the longest of the posterior spurs; middle tarsi with first and second segments about equal in length; front tibiae with basal outer tooth in front of middle (about as in fig. 2); claws abruptly angulate and cleft subapically, tooth almost as long as claw. Genitalia (fig. 6), the outer lobes are joined at less than basal fourth, their apices are truncate and not deflexed.

Type Locality: Elmwood, Tennessee. Type, male, in the collection of the American Museum of Natural History. Sixty paratypes: New York: 1 female. Kentucky: 1 female; Princeton, Apr. 29, 1937, 1 male; Lexington, Sept. 8, 1940, 1 male; Minorsville, May 8, 1939, 2 females. Indiana: Orleans, Apr., June, 1934, 1939, 5 males, 10 females. Illinois: Carbondale, May 19, 1910, 2 males "on oaks"; Pittsfield, July 6, 1946, June 3, 1948, 6 males, 13 females; Rock Island, June 3, 1930, 1 male. Iowa: 1 female; Mt. Pleasant, June 1, 1926, 1 female. Missouri: Ranken, May 20, 1934, 1 female. Nebraska: Fort Omaha, May, 1943, 1 female; Sioux Co., June 22, 1926, 1 female. Kansas: 1 female; Topeka, 1 male; Lawrence, June, 1925, 1933, May, 1951, 2 males, 3 females; Douglas Co., 1 female; Osage Co., June 14, 1925, 1 male; Montgomery Co., 1916, 1 female. Oklahoma: Sulphur, May 23, 1937, 1 male. Texas: Jeff Davis Co., July 8, 1933, 1 female. Paratypes in the collection of the American Museum and of the University of California.

Diagnosis: Distinguished from its close relatives, *fulva* and *harperi*, principally by the difference in the male genitalia (figs. 4-6), but distinguished from them externally only by rather slight and relative characters; from *fulva* by the arcuate, not virtually straight, sides of the pronotum; from *harperi* by the more sparsely punctured head and clypeus, especially the vertex of the head which usually has impunctate areas, and by the slight interruption between head and clypeus at the suture (in *harperi* the head and clypeus are equally densely punctured as if they were one). The clypeus in *blanchardi* is usually not so broad as in *harperi* and is sometimes subsinuate at middle, the eyes, pygidium, and antennal club are bigger, the pygidium more sparsely punctured, the last palpal segment is stouter, the labrum flatter, the apices of the penis flat and truncate, the lobes joined nearer base.

Remarks: Most of the 21 male and 39 female paratypes are from separate localities except for two series, one from Pittsfield, Illinois, and one from Orleans, Indiana. I have examined dissected males of *harperi* from these same localities, and the two species also from other identical places. No *blanchardi* have been seen from the southeastern coastal states where *harperi* has been taken, but it may be found to occur there.

The sexes are rather difficult to distinguish externally in both *blanchardi* and *harperi* because the shape of the pygidium varies and because the first hind tarsal segment in the male is shorter than the spur and is widened at the apex as in the female, not thin and elongated as in the males of most *Diplotaxis*. It is, however, slightly narrower than in the female, the hind femora are also narrower, the hind tarsi longer, and the spurs narrower and more pointed. Thirteen of the 21 males were dissected.

The size range of the paratype series is from 8 to 10 mm. More individuals are piceous and dark in color than are reddish like the type. The pronotal and elytral punctuation is often more confluent than in the type, the elytral costae are often virtually obliterated by the punctures. The scutellum is generally impunctate, but may have quite a few shallow punctures.

Three males and three females from Urbana, Illinois (taken at four different dates) have not been included as paratypes because there is some doubt as to whether they are this species. The males have the inner edge of the hind tibiae very hairy and although males of *blanchardi* from nearby places in Illinois and elsewhere do have a few hairs, they are certainly not so abundant. More specimens from Urbana are needed to show whether this is an individual variation. The male genitalia are also slightly different, being stouter and more widened apically, but essentially the same.

DIPLOTAXIS LANGUIDA LeConte, 1878

Type Locality: Tampa, Florida.

Florida only. A very pale yellow species, often with the pronotum slightly reddish; elongate, small, with a short clypeus as in *bidentata*, about one third or one fourth of the length of the head.

DIPLOTAXIS LIBERTA (Germar), 1824

Type Locality: America septentrionali.

Synonyms: *Melolontha moesta* Say, 1825; type locality, United States. *Diplotaxis georgiae* Blanchard, 1850; type locality, Savannah, Georgia.

Atlantic and Gulf coasts and inland. Massachusetts, Connecticut, New York, New Jersey, Delaware, *Maryland, *District of Columbia, Virginia, North Carolina, South Carolina, Georgia, Mississippi, and inland, *Kentucky, *Iowa, and Ontario, Canada.

Often confused with *tristis*, but the pronotal front angles are usually narrower, more acute, and the pronotal punctuation sparser, less uniform.

DIPLOTAXIS PUNCTATORUGOSA Blanchard, 1850

Type Locality: Savannah, Georgia.

Synonyms: *Diplotaxis excavata* LeConte, 1856; type locality, Georgia. *Diplotaxis frontalis*, LeConte, 1856; type locality, Georgia. *Diplotaxis densicollis* Fall, 1909; type locality, South Carolina.

Atlantic and Gulf coasts and inland. Rhode Island, New Jersey, Delaware, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, Texas, and inland in Oklahoma.

Distinguished from all eastern species by the ridged head. The broad rounded clypeus and large labrum associate this small species with the members of the *harperi-fulva* group. The reasons for the synonymy were given by Vaurie (1954, p. 51); I have since dissected some males and find the genitalia of the three forms similar. A correction is necessary in that I stated that the type locality of *excavata* was not designated by LeConte, and it was designated as Georgia.

DIPLOTAXIS RUFA Linell, 1895

Type Locality: Georgiana, Florida.

Florida only. Size of the above species. Close to *subcostata*, with the same kind of sinuation of the sides of the pronotum, the same front tibiae, with the third or upper tooth tiny or obsolete, but distinguished from it and all other species I know by the intensely pock-marked appearance of the head. I have seen only five specimens.

DIPLOTAXIS SORDIDA (Say), 1825

Type Locality: United States.

Synonym: *Diplotaxis rugosioides* Schaeffer, 1907; type locality, Hampton, New Hampshire.

Atlantic and Gulf coasts and inland. New Hampshire, Massachusetts, Connecticut, New York, New Jersey, Pennsylvania, Virginia, North Carolina, Georgia, Mississippi, and inland in Michigan.

This large species (11 mm.) is the only one in the eastern area that is hairy dorsally. It is so uniformly finely, densely, rugosely punctured dorsally that the differentiation between the broad and narrow (or costal) intervals of the elytra cannot be made; even the limits of the sutural interval are obscured. It is also quite distinct because of its very deeply emarginate clypeus.

The form *rugosoides* is said to differ "in the absence of dense, yellowish pubescence of the thorax and also the much shorter and scarcely visible pubescence on the elytra" (Schaeffer, p. 62) and I have seen a number of specimens from various localities that have this short pubescence throughout. However, I believe this is due to wear and/or to individual variation because, although most of the specimens have the pronotal hairs longer and denser than those on the elytra, some have the hairs equally long on both pronotum and elytra or even equally short on both (*rugosoides*), and some have both long and short pubescence on the elytra. The male genitalia of the short and long haired forms appear to be identical.

DIPLOTAXIS SUBCOSTATA Blanchard, 1850

Type Locality: Savannah, Georgia.

Synonym: *Diplotaxis castanea* Burmeister, 1855; type locality, North America.

Atlantic and Gulf coasts. New Jersey, *Pennsylvania, South Carolina, Georgia, Florida, *Alabama, *Texas.

Similar to *rufa* but usually larger, and with the head sparsely, not densely punctured. Apparently the only species with the prosternal process bicarinate, instead of unicarinate.

DIPLOTAXIS TRISTIS Kirby, 1837

Type Locality: "latitude 54°," [Canada].

Synonym: *Diplotaxis corpulenta* Burmeister, 1855; type locality Pennsylvania.

Atlantic coast and inland. *Maine, New Hampshire, Vermont, Massachusetts, Connecticut, New York, New Jersey, Pennsylvania, and Nova Scotia, Canada; inland in Michigan, *Kansas, and Ontario, Canada.

Same size and general appearance as *liberta* and *atlantis*, differing from the former as stated in the key and from both in the more arcuate front margin of the labrum which is also longer and narrower.

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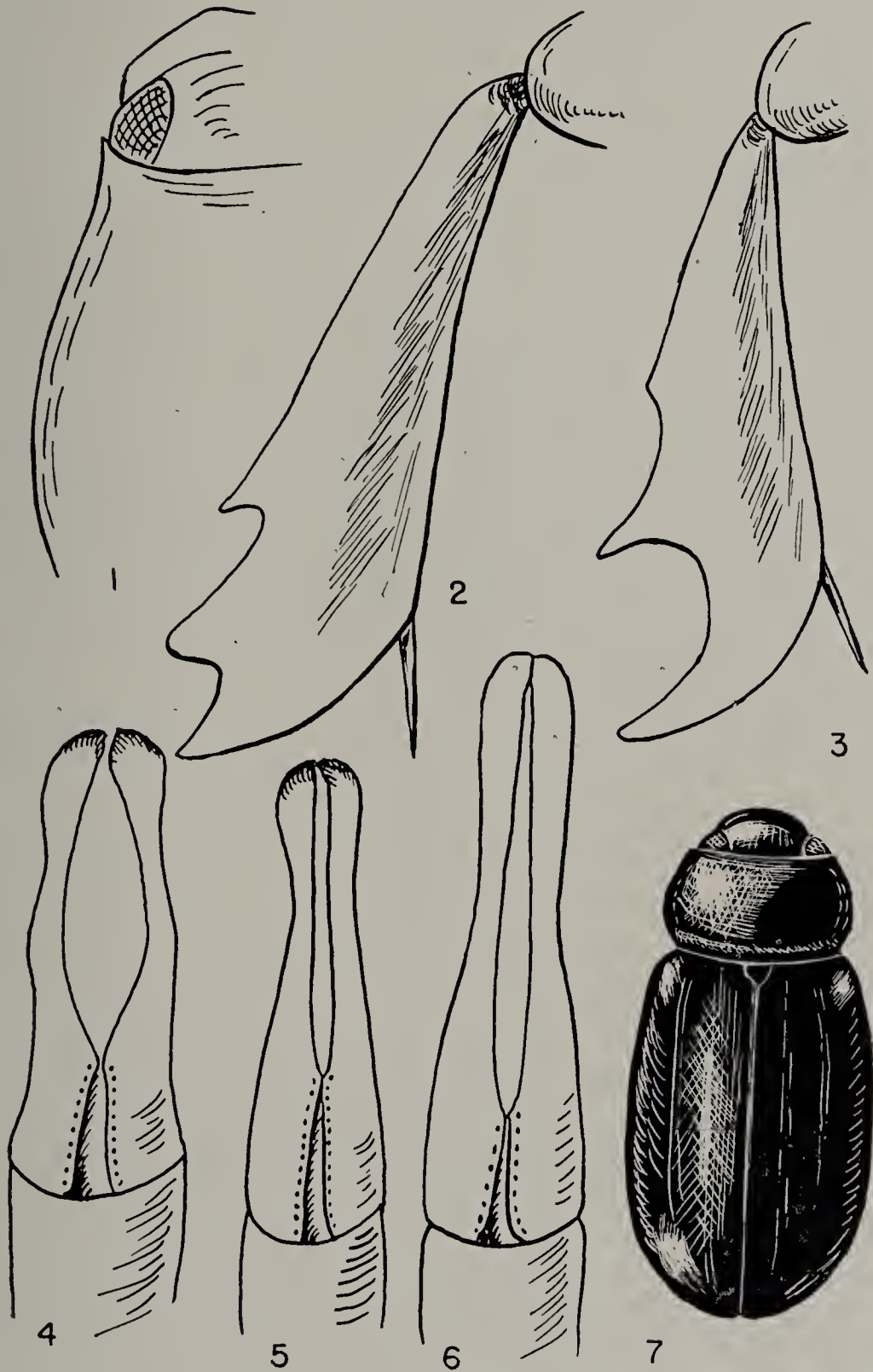


FIG. 1. Pronotum of *Diplotaxis liberta*, showing front angle. FIG. 2. Front tibia of *D. atlantis* and *D. frondicola*. FIG. 3. Front tibia of *D. bidentata*, *languida*, *rufa*, and *subcostata*. FIG. 4. Male genitalia of *D. fulva*, South Orange, N. J. FIG. 5. Male genitalia of *D. harperi*, Kentucky. FIG. 6. Male genitalia of *D. blanchardi*, new species, type, Elmwood, Tenn. FIG. 7. *Diplotaxis blanchardi*, new species.